Harrier 128 x 128 L-band Matrix

Ultra compact with configurable inputs and outputs

ETL's new ultra compact Harrier matrix provides routing for up to 128 input and output feeds, with integrated LNB powering in a 10U high chassis. The configurable design offers a range of input and output modules (IO modules) with features to suit specific RF needs for each satellite feed. The matrix can be expanded from 8x8 up to 128x128 in blocks of 8.

Minimal downtime

All active components can be hot-swapped without the need to re-boot the matrix. This includes power supplies, CPU modules, RF modules & fan trays.

LNB powering

13/18V & 22kHz tone available

Power saving

Only active signal routes are powered. This provides a greatly reduced power consumption compared to traditional matrices.

Minimal training

Capacitive touchscreen controls, intuitive HMI and an improved web browser interface

Compact

10U high chassis providing 128 inputs x 128 outputs with integrated LNB powering. Expandable in blocks of 8.

850 - 2450 MHz

Operating frequency range, Ka-band ready

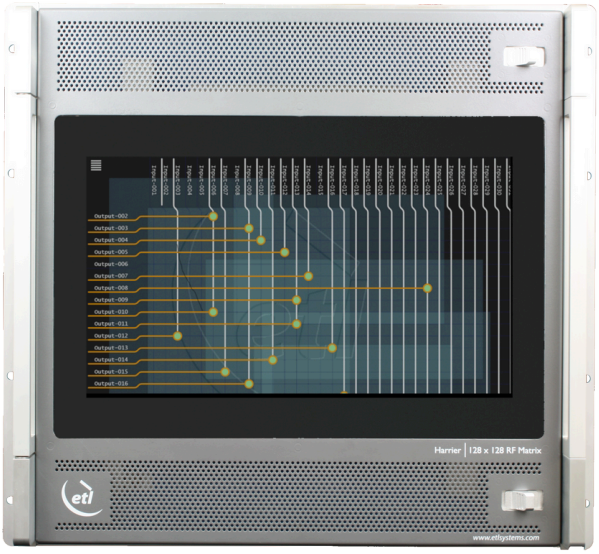
Configurable

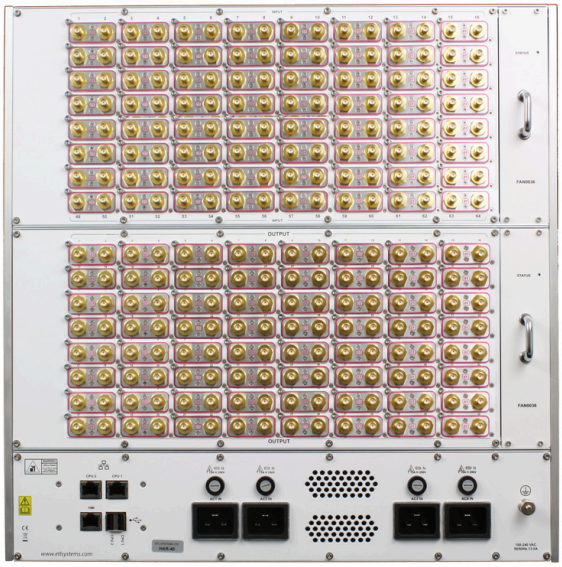
input and output modules with features to suit specific RF needs for each satellite feed, including fixed gain, variable gain, LNB powering & fibre inputs.

Temperature monitoring

With intelligent fan speed control

Harrier 128 x 128 L-band Matrix





Module Options

Passive Input/Output
H-IO-01

- Passive input/output module (0dB gain matrix)
- RF power monitoring

Active Input
H-IN-02

- Active variable gain input module (-10 to +20 dB, in 0.5 dB steps)
- Variable slope (0 to 6 dB, in 1 dB steps)
- RF power sensing

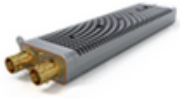
Active Fibre Input
H-IN-03

- Optical fibre input module
- AGC with settable output power level
- RF power monitoring

Passive LNBB Input
H-IN-04

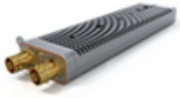
- Passive input module (0dB gain matrix)
- 13/18V & 22kHz tone LNB powering
- RF power monitoring

Active LNB Input
H-IN-05



- Active variable gain input module (-10 to +20 dB, in 0.5 dB steps)
- Variable slope (0 to 6 dB, in 1 dB steps)
- LNB powering
- RF power sensing

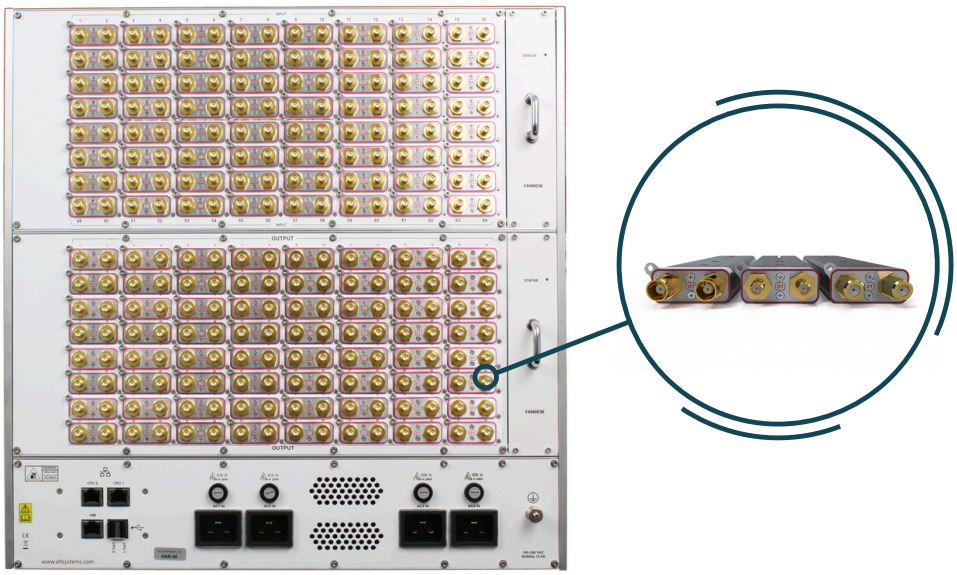
Active Output
H-OP-08



- Active variable gain input module (up to +30 dB)
- Variable slope
- RF power sensing

Flexibility & Reliability

Tune the matrix for optimum system performance



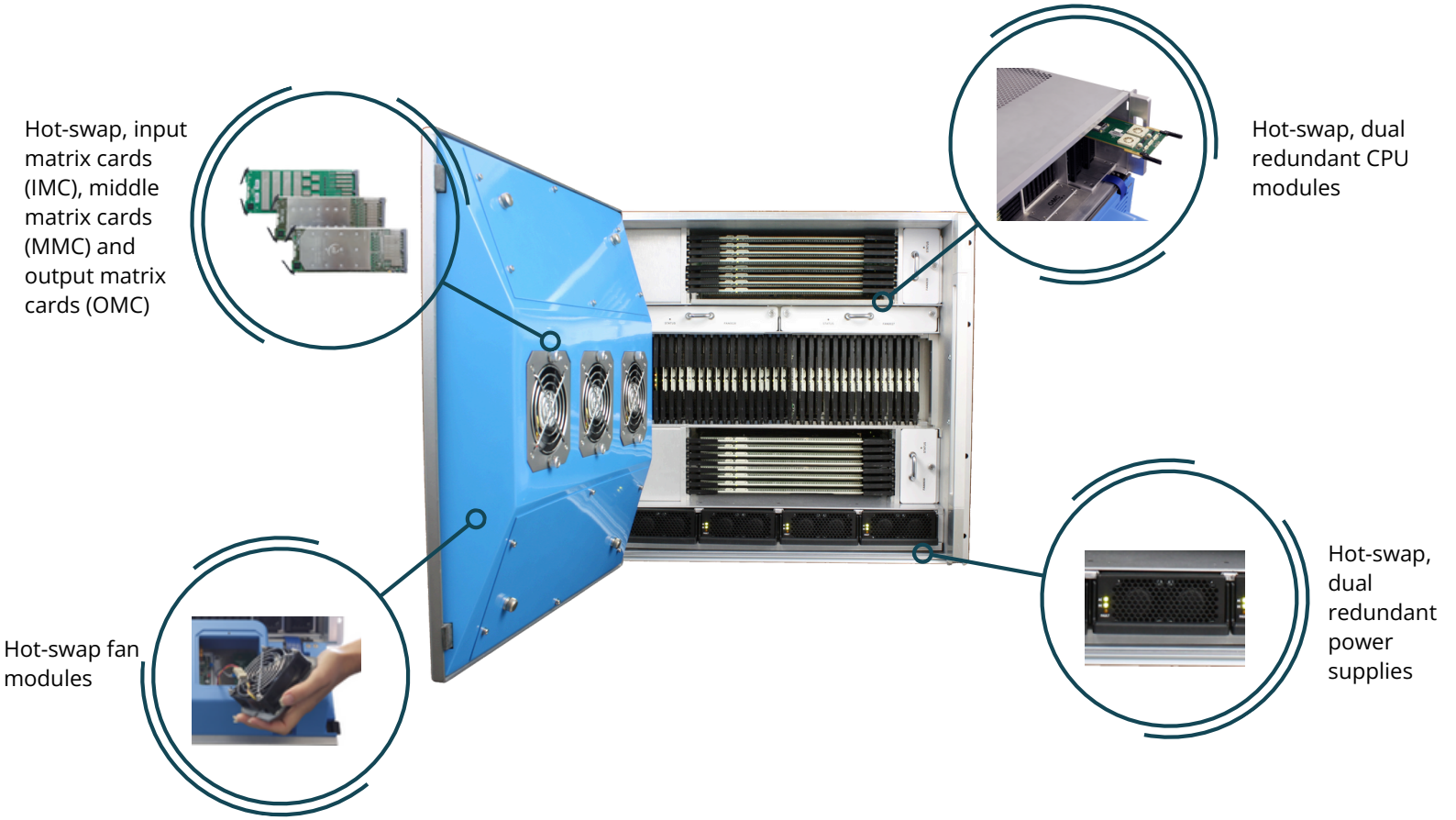
IO (Input and Output) modules can be mixed and configured to exact earth station requirements within the same matrix.

- For distant antennas, fibre modules can be used on the inputs of the matrix
- For large antennas, passive input or output modules can be installed to provide unity gain
- For smaller antennas or weak signals, variable gain, active input modules are ideal

Impedance mismatch problems can be avoided with the option of mixed impedances on IO modules (input to input or input to output).

64 input modules and 64 output modules are installed on a fully populated 128 x 128 matrix.

Enhanced Resilience



Configuration Options:

Passive Input Module (H-IO-01) with Passive Output Module (H-IO-01) - No LNB option
Passive Input Module (H-IN-04) with Passive Output Module (H-IO-01) - LNB option

Technical Specifications & Operating Parameters					
Capacity		128 inputs x 128 outputs		Non-blocking	
Frequency Range		850 to 2450MHz (Extended L-band)			
Gain		0 dB ((± 2.0 dB)		Relative to the mean gain across the frequency range	
Gain Tracking		4 dB		Difference in mean gain between any two outputs when the same input is routed to both. Measured at 0dB gain	
Noise Figure	L-band (up to 2150 MHz)	20 dB		Maximum (worst case) = Typ. +2dB	
	Full band(up to 2450 MHz)	22 dB			
Group delay Variation (Max.)	950-2150 MHz	±0.5 ns pk-pk		Peak to peak, across the specified bandwidth	
	850-2450 MHz	±0.5 ns pk-pk			
	Any 36 MHz	±0.25 ns pk-pk			
RF Input Power Sensing Range		-5 to -55 dBm			
Absolute Maximum RF Input Power		+20 dBm (100mW)		No damage level. Operation beyond this level may cause damage to the product	
Isolation	I/P - I/P	+80 dB (typ.2), +60 dB (min.)		Between any pair of input ports	
	O/P - O/P	+80 dB (typ.2), +60 dB (min.)		Between any pair of output ports	
	I/P - O/P	+60 dB (typ.2), +50 dB (min.)		Between any pair of input and output ports	
Input P1dB (1dB gain compression point, output power)	Typical	+0 dBm			
	Worst Case Typical	-2 dBm			
Output IP3 3rd order intercept point, output power	850-2150 MHz Typical	+15 dBm		Worst case typical -2 dBm	
	850-2450 MHz Typical	+10 dBm			
Signal Related Spurs (Max.)		-60 dBc		Relative to carrier in the 850-2450 MHz band	
Non-signal Related Spurs (Typ.)		-110 dBm in 10kHz		Measured in a 10 kHz bandwidth, DC-6GHz	
LNB Powering Available with H-IN-04 input IO module	LNB Voltages	0/13/18VDC User selectable			
	LNB Current (Max.)	400mA max Fitted with short circuit protection			
	22 kHz	0/22 kHz tone ON/OFF User selectable			
RF Connectors & Imp.		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Gain Flatness Typ.	950-2150MHz	±1.50 dB	±1.50 dB	±1.75 dB	±1.75 dB
	850-2450MHz	±2.50 dB	±2.50 dB	±2.75 dB	±2.75 dB
	Any 36MHz	±0.50 dB	±0.50 dB	±0.65 dB	±0.65 dB
Input Return Loss	Typical	17 dB	17 dB	16 dB	16 dB
	Minimum	13 dB	13 dB	12 dB	12 dB
Output Return Loss	Typical	17 dB	17 dB	16 dB	16 dB
	Minimum	13 dB	13 dB	12 dB	12 dB

Configuration Options:

Optical Input Module (H-IN-03) with Passive Output Module (H-IO-01)

Technical Specifications & Operating Parameters					
Input Plane: Optical Input Ports					
Capacity		128 inputs, non-blocking			
Optical Input Wavelength Range		1100 to 1650 nm			
Optical Input Power Range		-9.5 dBm to +5 dBM		Detector is limited to -9.5 dBm. Lower inputs are functionally possible but detector will not provide accurate reading.	
Input Optical Connector Options		FC/APC & SC/APC		Single mode fibre, angle polished connectors only.	
Output Plane: RF Output Ports					
Output RF Frequency Range		850-2450 MHz (extended L-band)			
Output Gain Tracking (Typ.)		4 dB		Difference in mean gain between any two outputs when the same input is routed to both. Measured at 0dB gain.	
Output Connector & Impedances		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Output Return Loss	Typ.	14 dB	14 dB	12 dB	12 dB
	Min.	10 dB	10 dB	10 dB	10 dB
System Performance: RF to Fibre & back to RF					
Gain		0 dB (± 2 dB)		Test Condition: When passive Io module H-IO-01 is fitted at the output ports.	
Output AGC Flatness (Typ.)		±3.5 dB		Test condition: Full TX &RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Input levels within -10 to -40 dBm.	
Output Connector & Impedances		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Gain Flatness (Typ.)	950-2150MHz	±2.75 dB	±2.80 dB	±3.00 dB	±3.00 dB
	850-2450MHz	±2.50 dB	±2.60 dB	±2.75 dB	±2.75 dB
	Any 36MHz	±0.50 dB	±0.60 dB	±0.65 dB	±0.65 dB
		Test condition: Full TX &RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode			
Group Delay Variation (Max.)	950-2150 MHz	±1.5 ns pk-pk		Peak to peak, across the specified bandwidth. Full TX &RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode.	
	850-2450 MHz	±2 ns pk-pk			
	Any 36 Mhz	±0.5 ns pk-pk			
Isolation	I/P - I/P	70 dB (typ.[2]), 55 dB (min.)		Between any pair of input ports. Test condition: Full TX &RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode.	
	O/P - O/P	70 dB (typ.[2]), 55 dB (min.)		Between any pair of output ports. Test condition: Full TX &RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode.	
	I/P - O/P	60 dB (typ.[2]), 50 dB (min.)		Between any pair of input and output ports. Test condition: Full TX &RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode.	
Noise Figure (Typ.)		10 dB		Test condition: SRY-TX-L1-103, 0 dB optical link loss, -50 dBm RF i/p power, -10 dBm o/p power.	
CNR (any 36 MHz)		38 dB (Min.)			
Output P1 (Typ.)		+1 dBm		Test condition: SRY-TX-L1-103, 0 dB optical link loss, -50 dBm RF i/p power, -10 dBm o/p power.	
Output IP3	Typical	18 dBm		Test condition: SRY-TX-L1-103, 1m fibre, 10 dB gain, -22 dBm tones at 2150 and 2152 MHz.	
	Minimum	12 dBm			
SFDR	Typical	105 dB			
	Minimum	100 dB			

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Configuration Options:

Active Input Module (H-IN-02) with Passive Output Module (H-IO-01) - No LNB option
Active Input Module (H-IN-05) with Passive Output Module (H-IO-01) - LNB option

Technical Specifications & Operating Parameters					
Capacity			128 inputs x 128 outputs		Non-blocking
Frequency Range			850 to 2450MHz (Extended L-band)		
Variable Gain Range		Maximum	+20 dB (± 2.5 dB)		Relative to the mean gain across the frequency range
		Minimum	-10 dB (± 2.5 dB)		
		Variable Gain Step	0.5 dB (± 0.25 dB)		
Gain Tracking (Typ.)			4 dB		
Variable Slop (Tilt) Control			0 dB to -6 dB (± 1 dB)		Positive Slope with pivot point at 2150MHz
Slope Step			0.5 dB (± 0.5 dB)		
Group delay Variation (Typ.)		950-2150 MHz	±0.5 ns pk-pk		Peak to peak, across the specified bandwidth
		850-2450 MHz	±0.5 ns pk-pk		
		Any 36 MHz	±0.25 ns pk-pk		
RF Input Power Sensing Range			-5 to -55 dBm		
Absolute Maximum RF Input Power			+20 dBm (100mW)		No damage level. Operation beyond this level may cause damage to the product
Isolation		I/P - I/P	+70 dB (typ.[2]), +60 dB (min.)		Between any pair of input ports
		O/P - O/P	+70 dB (typ.[2]), +60 dB (min.)		Between any pair of output ports
		I/P - O/P	+60 dB (typ.[2]), +50 dB (min.)		Between any pair of input and output ports
Signal Related Spurs (Max.)			-60 dBc		Relative to carrier in the 850-2450 MHz band
Non-signal Related Spurs (Max.)			-110 dBm in 10kHz		Measured in a 10 kHz bandwidth, DC-6GHz
LNB Powering Available with H-IN-05 input IO module			0/13/18VDC @ 400mA max, 0/22 kHz tone, User selectable		
Connectors & Impedances			50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Gain Flatness Typ.		950-2150MHz	±1.75 dB	±1.75 dB	±2.75 dB	±2.75 dB
		850-2450MHz	±2.50 dB	±2.50 dB	±3.00 dB	±3.00 dB
		Any 36MHz	±0.50 dB	±0.50 dB	±0.65 dB	±0.65 dB
Input Return Loss		Typical	17 dB	17 dB	16 dB	16 dB
		Minimum	13 dB	13 dB	12 dB	12 dB
Output Return Loss		Typical	17 dB	17 dB	16 dB	16 dB
		Minimum	13 dB	13 dB	12 dB	12 dB
Noise Figure (Typ.)		At +20 dB gain	9 dB		10 dB	
		At 0 dB gain	24 dB		25 dB	
		At -10 dB gain	34 dB		35 dB	
Input P1dB (Typ.) measured at 0dB slope setting		At +20 dB gain	-20 dBm		-17 dBm	
		At 0 dB gain	-3 dBm		0 dBm	
		At -10 dB gain	+6.5 dBm		+9 dBm	
Output IP3 (Typ.) measured at 0dB slope setting	L-band (up to 2150 MHz)	At +20 dB gain	+15 dBm			
		At 0 dB gain	+12 dBm			
		At -10 dB gain	+10 dBm			
	Full band (up to 2450 MHz	At +20 dB gain	+13 dBm			
		At 0 dB gain	+10 dBm			
		At -10 dB gain	+8 dBm			

Technical Specifications & Operating Parameters			
Capacity		128 inputs and 128 outputs, configurable in banks of 8 inputs/outputs	
Frequency		850 to 2450 Mhz	
Connector & Impedances		50Ω SMA, 50Ω BNC, 75Ω BNC & 75Ω F-type	
LNB Powering			
LNB Power		Dependent upon IO modules	
LNB Current Alarm	Over-current	450 mA	Factory defaults (user settable)
	Under-current	50 mA	
LNB Short Circuit Protection		Electronic fuse	Automatic reset when short removed
Control, Monitoring & Alarms			
Remote Control & Monitoring		Ethernet – RJ45 connector, 10/100/1000BaseTx, ETL Protocol over TCP, SNMP, Web Interface, Grass Valley NVision NV9000	
HMI		Capacitive touch screen	
Secure Communications		HTTPS, SNMPv3	
ETL Protocol over TCP		Supports up to 32 concurrent connections	
Web Browser		Full remote control via web browser for 5 connections	
Alarms		Comprehensive alarm status via HMI display and communication protocols.	
Switching Time		50ms max. (Measured from receipt of command on serial port to establishment of RF signal)	
RF Level Alarms		Configurable upper and lower RF input level alarms. Local and remote reporting.	
Amplifier Status		Monitored. Local and remote reporting.	
Temperature Monitoring		Monitored individually. local and remote reporting.	
Fan			
PSU Loading			
Non RF Parameters			
All Active Cards		Hot swappable	
PSU Modules		Dual redundant hot swappable	No external PSU required for LNB power
CPUs		Dual redundant hot swappable	
IO Modules		Hot swappable	
Power Requirement		85-264VAc 47-63Hz	Fused 15A
AC Power Consumption		1200W	With passive input and output modules, 128 paths routed
		1800W	Maximum allowed AC power consumption including LNB powering
MTBF		150,000 hours (17.1 years)	128x128 chassis without LRUs
MTBF (IO Modules)		200,000 hours (22.8 years)	Each IO module
MTBF (RF Cards)		180,000 hours (20.5 years)	Each active RF card
MTTR		10 minutes	Assumes recommended spares are available
Physical & Environmental			
Dimensions		10U high x 650mm deep x 19" wide	
Weight		Up to 100kg	
Front Panel Colour		RAL9023 – Pearl Dark Grey	
Temperature		Operating: 0 to 45˚C / Storage: -20˚C to +75˚C	
Location		Indoor use only	
Humidity		20 to 90% non-condensing	
Altitude		10,000ft Above Mean Sea Level	
Absolute Maximum Ratings			
Max. DC Voltage on IO Ports		48Vdc, all ports are DC blocked	

Note 1: The specification is subject to regular reviews and will be updated from time to time as part of our continuing product development and improved spec accuracy.
Note 2: Operation beyond the quoted limits stated above may cause instantaneous and permanent damage.

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